



Northern Colorado Plateau Network



CANYONLANDS NP/STAFF PHOTO

Inventory & Monitoring Program Enhances Resource Protection

The National Park Service's mission is to manage park resources "unimpaired for future generations." Protecting and managing some of our nation's most significant natural resources requires basic knowledge of the condition of ecosystems and species that occur in national parks. In order to better understand the health of the parks, the Inventory and Monitoring Program was established in the early 1990s. This program organized all parks with significant natural resources into 32 networks based on proximity and ecological similarity. There are two major components to the Inventory and Monitoring Program: 1) to gather baseline information about parks through 12 natural resource inventories and 2) to conduct long-term monitoring for key indicators of ecological health, or vital signs.

Park visitors may see scientists working both on land and in water. In fields from terrestrial botany to aquatic ecology, ecologists are collecting data using rigorous scientific methods. This fieldwork

provides park managers with credible scientific information to meet the challenges of preserving and protecting park resources for public benefit and enjoyment. Data managers, scientists, resource managers, and rangers all have a hand in collecting, synthesizing, and using this information.



Water-quality information can help assess the health of a stream and identify pollution sources.

ZION NP/DAVID THOMA



Long-term vital signs monitoring helps determine changing conditions of natural resources in order to guide adaptive management decisions.

BRYCE CANYON NP/AMY TENDICK

NCPN Ecosystems

The Northern Colorado Plateau contains diverse plant communities that are found along a wide range of elevations. Below is a photo tour showing the changes in vegetation from high to low elevations within the network.



Aspen forest
Fossil Butte NM



Subalpine meadow
Cedar Breaks NM



Ponderosa woodland
Bryce Canyon NP



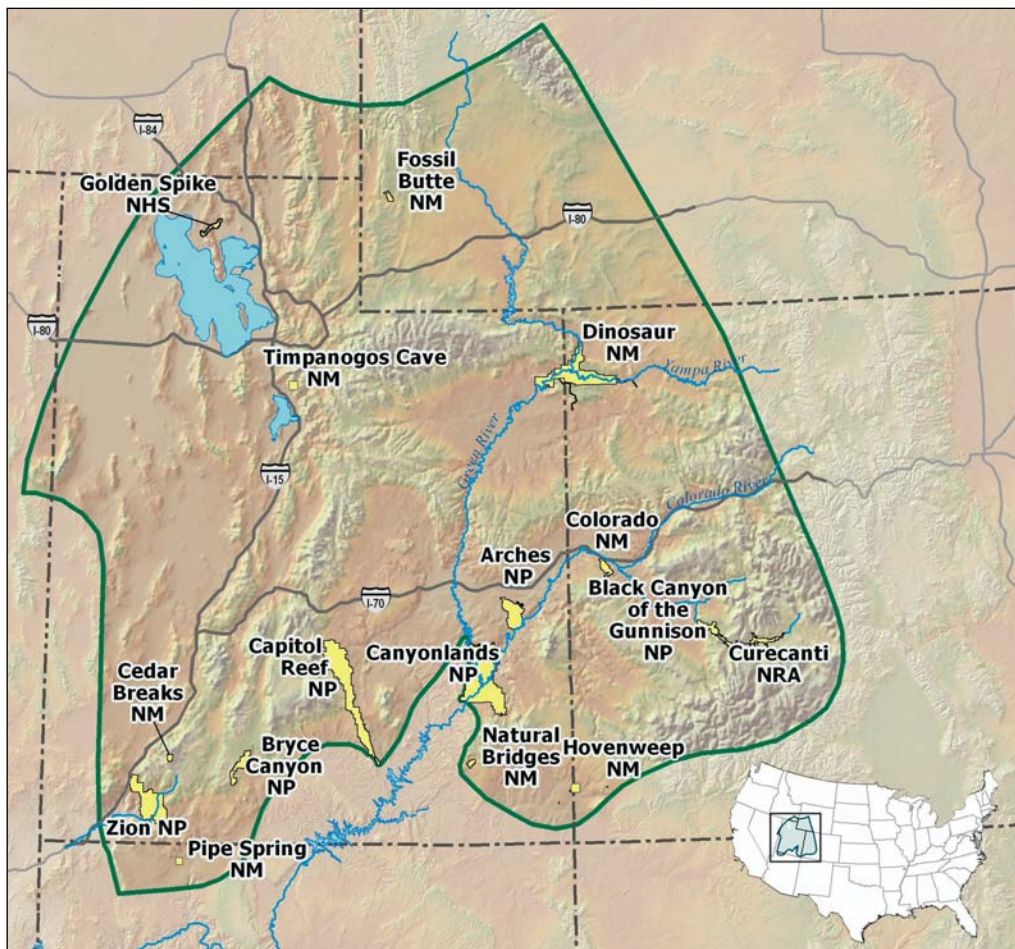
Pinyon-juniper woodland
Colorado NM



Sagebrush shrubland
Zion NP



Blackbrush shrubland
Capitol Reef NP



The sixteen units of the NCPN include national parks (NP), national monuments (NM), a national historic site (NHS), and a national recreation area (NRA).

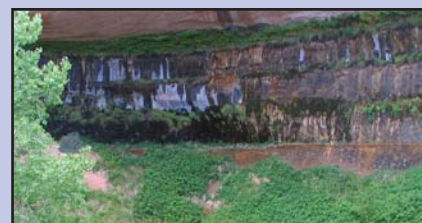
The Northern Colorado Plateau Network

The Northern Colorado Plateau Network (NCPN) covers a geologically and biologically diverse region comprising 16 national parks in four western states. These parks contain desert grasslands, shrublands, forests, caves, large rivers, perennial streams, seeps, springs, and striking structural geology. Each ecosystem provides habitat for plants and animals that depend on it for their survival. Parks in the network range in size from 40 to more than 337,500 acres

and occur between 3,600 and 10,500 feet in elevation. Invasive plants, trampling and grazing by livestock, and adjacent land-use activities are some of the most significant threats to NCPN parks. NCPN parks are home to threatened and endangered species such as the Mexican spotted owl, Utah prairie dog, humpback chub, the San Rafael cactus, and the Wright fishhook cactus, as well as the more common species that help to keep ecosystems fully functioning.



Desert grassland
Canyonlands NP



Hanging garden
Arches NP



Canyon riparian woodland
Dinosaur NM

Vital Signs Monitoring

Scientists within the Northern Colorado Plateau Network monitor the condition of natural resources such as water, air, plants, and animals, as well as the various ecological, biological, and physical processes that act on those resources. Multiple monitoring efforts will help inform managers of the health of park resources. Monitoring will provide early detection of potential problems, enabling park managers to be proactive in minimizing damage to park resources. For example, data from long-term vegetation monitoring can encourage habitat restoration, trigger invasive plant eradication, and inform prescribed fire management planning. Network personnel are working with park staff and regional scientists to ensure that the program is based on sound science and that the information generated is integrated into the adaptive management of the 16 network parks.

The network has selected 29 vital signs (see table) for the long-term monitoring program. Network staff are entirely responsible for data collection, analysis, and reporting on 19 vital signs. For ten other vital signs, the network collaborates with existing park monitoring programs and university or research partners to expand the scope of the program. Vital signs will be assessed relative to one another across temporal and spatial scales to provide comprehensive assessments of ecosystem health.

Vital Signs of the NCPN Monitoring Program	
Monitoring Category	Vital Sign
Air and Climate	Ozone Wet and Dry Deposition Visibility and Particulate Matter Climate
Geology and Soils	Stream / Wetland Hydrologic Function Biological Soil Crusts Upland Hydrologic Function Upland Soil / Site Stability
Water	Surface Water Dynamics Ground Water Dynamics Water Chemistry Aquatic Macroinvertebrates
Biological Integrity	Invasive Plants Insect / Disease Outbreaks Riparian Plant Communities Springs, Seeps, and Hanging Gardens Native Grassland Communities Shrubland Communities Predominant Plant Communities Land Bird Communities Peregrine Falcons Threatened and Endangered Plants
Human Use	Visitor Use and Patterns Human Demographics and Developments
Ecosystem Patterns and Processes	Fire Dynamics Land Cover Landscape Connectivity and Fragmentation Upland Nutrient Cycling Land Condition

STEVE DEWEY



Canyonlands NP

INVASIVE PLANTS

Invasive exotic plant species are a major threat to NCPN parks, given their ability to quickly expand into new areas and compete with and exclude native species. Prevention of plant invasions is the most effective approach to managing invasive species; early detection of new invasive species is the next critical step. Because there is often a time lag between the initial establishment of an invasive exotic plant and its rapid expansion, early detection and eradication are essential. Monitoring in NCPN parks enables early detection of invasive plant species, allowing park management to initiate control efforts earlier in the invasion cycle.

ROCKY MTN BIRD OBSERVATORY



Colorado NM

LAND BIRDS

Land birds are a vital sign due to their value as indicators of ecosystem integrity and their high public appeal. They occupy various levels in the food web and play an important functional role in the flow of energy through ecosystems. The NCPN monitors land birds in collaboration with the Rocky Mountain Bird Observatory monitoring program, which is conducted throughout the Rocky Mountains, Great Plains, and Intermountain West. This partnership allows data from the relatively pristine sites in NCPN park lands to be compared to data from areas with higher land-use impacts. In this way, the knowledge gained from NCPN bird monitoring is useful not only to the national parks, but also to the entire region.

STEVE GARMAN



Canyonlands NP

UPLAND ECOSYSTEMS

The NCPN includes a broad range of upland ecosystems due to its diversity of soils, environmental conditions, and climate patterns. Past and current land-use practices (e.g., livestock grazing, fire suppression) have further altered the condition of these systems. Changes in soil structure and chemistry can have cascading effects on plants and the animals that depend on them. The NCPN is conducting integrated upland monitoring that includes measurements of vegetation composition and structure, soil and site stability, upland hydrologic function, nutrient cycling, and biological soil crusts. Together, these components will greatly increase understanding of the dynamics and condition of the predominant ecosystems and will provide early warnings of ecosystem change to help inform management decisionmaking.

Taking Inventory

The National Park Service has embarked on a new era of management that re-emphasizes reliance on science to improve management decisions and safeguard our natural heritage. An essential component of this strategy is a comprehensive inventory of the natural resources found in national parks. Natural resource inventories are being conducted for a range of features, including the presence and distribution of plants, animals, and non-living resources such as water, landforms, and climate. The NPS has established twelve "core" inventories:

- Automated Bibliographies
- Species Occurrence (vertebrates and vascular plants)
- Species Distribution (species of concern)
- Base Cartography Data (mapping)

- Vegetation Maps
- Soils Maps
- Geologic Maps
- Water Resource Inventory
- Water Chemistry Inventory
- Air Quality Inventory
- Air Quality-Related Values Assessment
- Meteorological Data Inventory

Partnerships are a key element of the park natural resource inventory process because they expand the expertise and skills available to the parks. Partners also allow the National Park Service to acquire inventory data in an efficient, timely, and cost-effective manner. Strong scientific collaborations ensure that the inventories yield information that will ultimately benefit natural resource management within network parks.

New Discoveries at NCPN Parks

SARAH TOPP



Left: Palmer's cleomella (*Cleomella palmeriana*)
Right: Brittle phacelia (*Phacelia demissa*)
Bryce Canyon National Park

JAMES GALLAGHER



Yellow-billed cuckoo (*Coccyzus americanus*)
Arches National Park

RENATA PLATENBERG



Great Basin spadefoot toad (*Spea intermontana*)
Golden Spike National Historic Site

ROGER W. BARBOUR



Western jumping mouse (*Zapus princeps*)
Cedar Breaks National Monument

GOLDEN SPIKE NHS/GEORGE OLIVER



First hybrid rattlesnake documented in Utah, at Golden Spike National Historic Site.

Snakes Alive!

Eleven national parks in the NCPN were inventoried for reptiles and amphibians as part of an agreement between the National Park Service Inventory & Monitoring Program and the U.S. Geological Survey Biological Resources Division office. The primary objective was to document 90% of the reptiles and amphibians present in each park. While the overall estimate of inventory completeness was high (average for the eleven parks was 80%), some species went undetected. The NCPN then entered into a cooperative agreement with George Oliver, a zoologist from the State of Utah's Division of Wildlife Resources Natural Heritage Program, to find these undetected species. George is renowned in Utah for his field expertise across all taxonomic groups, but he has a special love for . . . rattlesnakes!

One of his most interesting discoveries was a rattlesnake in Golden Spike National Historic Site that is a hybrid of the western rattlesnake (*Crotalus oreganus lutosus*) and the prairie rattlesnake (*Crotalus viridis viridis*). Photographs of rattlesnakes from the baseline inventory work in Golden Spike showed that both the western rattlesnake and the prairie rattlesnake occur there. Although George has been carefully examining many rattlesnakes from various parts of Utah, the one he captured in Golden Spike is the only individual considered to be a hybrid. It is well known that in captivity almost all species of rattlesnakes are capable of producing hybrid offspring, but hybridization in wild rattlesnakes seldom occurs.

For More Information



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